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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/519,554

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EXAMINER

PARSONS, THOMAS H

ART UNIT

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1795

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/519,554	<b>Applicant(s)</b> YOSHIZAWA ET AL.	
	<b>Examiner</b> THOMAS H. PARSONS	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites, "...a bipolar plate disposed outside the membrane electrode assembly, wherein: the bipolar plate is porous, and comprises: a first gas passage formed on a surface on one side of the membrane electrode assembly, a second gas passage formed on another surface on the opposite side of the membrane electrode assembly..."

It is unclear as to what the structural relationship is between the first and second gas passages and the membrane electrode assembly. It's unclear as to how the gas passages can be on opposite sides of the membrane electrode assembly while the bipolar plate is disposed outside of the membrane electrode assembly.

Claims 2-17 are rejected as being dependent upon base claim 1.

Claim 3 recites the limitation "the gas inlet manifold" and "the gas outlet manifold" in lines 4 and 5. There is insufficient antecedent basis for these limitations in the claim.

Claim 14 recites the limitation "the cooling mechanism" in line 2. There is insufficient antecedent basis for these limitations in the claim. Claims 15-17 are rejected as being dependent upon claim 14.

### ***Claim Objections***

3. Claim 14-17 are objected to because of the following informalities:

Claim 14, lines 2-3, the text, “so that the temperature of the gas flowing through the first gas passage is lower, the nearer the gas inlet is” appears awkwardly worded.

Claim 15, lines 3-5, the text, “so that the temperature of the gas discharged from the gas outlet is higher, the larger the gas pressure or gas usage rate of the fuel cell is” appears awkwardly worded.

Claim 16, lines 2-4, the text, “so that the temperature gradient of the gas flowing through the first gas passage increases, the higher the temperature or humidity of the gas at the gas inlet is” appears awkwardly worded.

Claim 17, lines 3-4, the text, “so that the temperature gradient of the gas flowing through the first gas passage increases, the larger the gas usage rate of the fuel cell is” appears awkwardly worded.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 5-6, and 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 2002/0055031) in view of Kaufman et al. (US 4,588,661).

**Claim 1:** Fujii et al. in Figures 1-4 disclose a fuel cell, comprising:

a membrane electrode assembly (abstract), and

a bipolar plate (10) disposed outside the membrane electrode assembly, wherein: the bipolar comprises:

a first gas passage (211) formed on a surface on one side of the membrane electrode assembly,

a second gas passage (211b) formed on another surface on the opposite side of the first gas passage,

a communicating passage ((201) which allows the first gas passage and second gas passage to communicate with each other,

a gas inlet (12C) for introducing gas connected to one of the first gas passage, and second gas passage, and

a gas outlet (13C) for discharging gas connected to the other of the first gas passage and second gas passage. See paragraphs [0019]-[0024], [0026]-[0027], [0065]-[0125], [0135]-[0144].

Fujii et al. disclose that the bipolar plate is made of a carbon material (paragraph [0150]) but is silent as to a porous bipolar plate.

Kaufman et al. in Figures 3, 5 and 6 disclose bipolar plates that are made of a porous carbon material. See abstract, col. 2: 3-26, col. 3: 67-col. 4: 15, and, col. 6: 1-col. 8: 59.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the bipolar plates of Fujii et al. by replacing Fujii et al.'s

bipolar plates with the porous carbon plates of Kaufman et al. because Kaufman et al. teach porous carbon bipolar plates that would have provided a more uniform gas distribution over the face of the respective anode and cathode thereby improving the overall performance of the fuel cell.

**Claim 2:** The rejection of claim 2 is as set forth above in claim 1 wherein further Fujii et al. in Figures 1-4 further disclose that

the gas inlet (12C) is connected to the first gas passage (211A),  
the gas outlet (13C) is connected to the second gas passage, and  
gas introduced from the gas inlet (12C) flows through the first gas passage (211A),  
communicating passage (201) and second gas passage (211B) in that order, and is discharged  
from the gas outlet. See paragraphs [0019]-[0024], [0026]-[0027], [0065]-[0125], [0135]-[0144].

**Claim 3:** The rejection of claim 3 is as set forth above in claim 1 wherein further Fujii et al. in Figures 1-4 disclose that the second gas passage (211B) is formed on the opposite side of the first gas passage (211A) so that the second gas passage is back-to-back with the first gas passage, and the gas outlet (13C) is formed on the opposite side of the gas inlet (12C) so that the gas outlet manifold is underneath the gas inlet manifold.

**Claim 5:** The recitation “wherein: the pressure of the gas flowing through the first gas passage is higher than the pressure of the gas flowing through the second gas passage” has been considered, and construed as a process limitation that adds no additional structure to the fuel cell. However, because the fuel cell of the Fujii et al. combination is structurally similar to that instantly claimed, it appears capable of providing the claimed process limitation.

**Claim 6:** The recitation “wherein: a differential pressure between the first gas passage and the second gas passage, is produced by a pressure loss in the communicating passage” has been considered, and construed as a process limitation that adds no additional structure to the fuel cell. However, because the fuel cell of the Fujii et al. combination is structurally similar to that instantly claimed, it appears capable of providing the claimed process limitation.

**Claim 11:** The rejection of claim 11 is as set forth above in claim 1 and 2 wherein further Fujii et al in Figures 21-21 disclose that the communication passage is an external manifold provided outside the bipolar plate which allows the first gas passage and the second gas passage to communicate (paragraphs [0235]-[0253]).

**Claim 12:** The rejection of claim 12 is as set forth above in claim 1 wherein further Fujii et al. in Figure 2 disclose a cooling mechanism which cools the bipolar plate. See paragraphs [0019]-[0024], [0026]-[0027], [0065]-[0125], [0135]-[0144].

The recitation “wherein: the cooling mechanism cools the bipolar plate so that the temperature of the gas flowing through the second gas passage is lower than the temperature of the gas flowing through the first gas passage” has been considered, and construed as a process limitation that adds no additional structure to the cooling mechanism. However, because the cooling mechanism of the Fujii et al. combination is structurally similar to that instantly disclosed, appears capable of performing the claimed process.

**Claim 13:** The rejection of claim 13 is as set forth above in claim 12. Further, the recitation “the cooling mechanism cools the bipolar plate from the side of the second gas passage” has been considered, and construed as a process limitation that adds no additional structure to the cooling mechanism. However, because the cooling mechanism of the Fujii et al.

combination is structurally similar to that instantly disclosed, appears capable of performing the claimed process.

**Claim 14:** The rejection of the claim is as set forth above in claim 13. Further, the recitation, “ wherein: the cooling mechanism cools the bipolar plate so that the temperature of the gas flowing through the first gas passage is lower, the nearer the gas inlet is” has been considered, and construed as a process limitation that adds no additional structure to the cooling mechanism. However, because the cooling mechanism of the Fujii et al. combination is structurally similar to that instantly disclosed, appears capable of performing the claimed process.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Kaufman et al. as applied to claims 1-2 above, and further in view of Issacci et al. (US 2003/0129468)..

Fujii et al. and Kaufman et al. are as applied, argued, and disclosed above, and incorporated herein.

**Claim 4:** The Fujii et al. combination does not disclose a first gas passage comprising:  
an upstream gas passage whereof one end is connected to the gas inlet and the other end is closed, and a downstream gas passage whereof one end is closed and the other end is connected to the communicating passage.

Issacci et al. in Figures 1-3 disclose a first gas passage comprising:  
an upstream gas passage whereof one end is connected to the gas inlet and the other end is closed, and a downstream gas passage whereof one end is closed and the other end is



connected to the communicating passage. See abstract, paragraphs [0030]-[0052], and [0062]-[0064].

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the fuel cell of the Fujii et al. combination by incorporating the first gas passage of Issacci et al. because Issacci et al. teach a first gas passage that would have provided for efficiently removing water produced at the cathode plates of a PEM fuel cell which would have enhanced the flow of cathode gas to the catalytic area and avoided the loss of cathode gas thereby improving the overall efficiency and performance of the fuel cell.

7. Claims 7-8 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Kaufman et al. as applied to claims 1-2, 5-6 and 14 above, and further in view of Takahashi et al. (7,049,016).

Fujii et al. and Kaufman et al. are as applied, argued and disclosed above, and incorporated herein.

**Claim 7:** The Fujii et al. combination does not disclose a differential pressure regulating mechanism which regulates the differential pressure by regulating the pressure loss in the communicating passage.

Takahashi et al. in Figure 1 discloses a differential pressure regulating mechanism (controller). See col. 1: 55-col. 2: 49 and col. 3: 9-58.

The recitation "which regulates the differential pressure by regulating the pressure loss in the communicating passage" has been considered, and construed as a functional language that adds no additional limitation to the differential pressure regulating mechanism. However,

Takahashi et al. on col. 3: 23-34 teaches a controller 16 comprising one, two or more microprocessors, a memory and an input/output interface. The controller 16 calculates a pressure difference  $\Delta P$  between the cooling water passage 9 and electrodes, a cathode 2 and anode 3 at the inlet of the fuel cell stack 1, from the signals from the pressure sensors 5, 6, 7. When the system is started, the controller 16 determines a pressure  $P_{cw}$  of cooling water according to the internal temperature  $T_{sin}$  of the fuel cell stack 1 detected by the temperature sensor 15, and controls the opening of a pressure reducing valve 11 and the rotation speed of the cooling water pump 12 so that a determined cooling water pressure  $P_{cw}$  is realized.

In light of this disclosure, it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the controller and the pressure sensors to regulates the differential pressure by regulating the pressure loss in the communicating passage

**Claim 8:** The rejection of claim 8 is as set forth above in claim 7 wherein further it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the controller and the pressure sensors to regulates the pressure loss according to the load of the fuel cell.

**Claim 15:** The Fujii et al. combination does not disclose a controller which functions to: regulate the cooling performance of the cooling mechanism so that the temperature of the gas discharged from the gas outlet is higher, the larger the gas pressure or gas usage rate of the fuel cell is.

Takahashi et al. in Figure 4 and 6 discloses a controller (16) to regulate the cooling performance of the cooling mechanism. See col. 5: 36-col. 7: 29.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the cooling mechanism of the Fujii et al. combination by incorporating the controller of Takahashi et al. because Takahashi et al. teach a controller that would have provided efficient water flow to the cooling water passage during startup from a low temperature, maintained water balance and resolved problems associated with clogging thereby improving the overall efficiency and performance of the fuel cell stack.

The recitation, “so that the temperature of the gas discharged from the gas outlet is higher, the larger the gas pressure or gas usage rate of the fuel cell is” has been considered, and construed as a functional limitation that adds no additional limitation to the controller. However, because the controller of Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance the claimed function.

**Claim 16:** The rejection is as set forth above in claim 15. However, the recitation, “so that the temperature gradient of the gas flowing through the first gas passage increases, the higher the temperature or humidity of the gas at the gas inlet is” has been considered, and construed as a functional limitation that adds no additional limitation to the controller. However, because the controller of Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance the claimed function.

**Claim 17:** The rejection is as set forth above in claim 15. However, the recitation, “so that the temperature gradient of the gas flowing through the first gas passage increases, the larger the gas usage rate of the fuel cell is” has been considered, and construed as a functional that limitation that adds no additional limitation to the controller. However, because the controller of Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance

the claimed function.

8. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. in view of Kaufman et al. as applied to claims 1-2 above, and further in view of Ringel (US 5,932,366).

Fujii et al. and Kaufman et al. are as applied, argued, and disclosed above, and incorporated herein.

**Claim 9:** The Fujii et al. combination does not disclose that the communicating passage is a through-hole passing through the bipolar plate.

Ringel in Figure 12 discloses that the communicating passage is a through-hole passing through the bipolar plate (abstract and col. 3: 55-col. 4: 37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the fuel cell of the Fujii et al. combination by incorporating the communicating passage of Ringel because Ringel teaches a communication passage that would have provided a means for uniformly heating the fuel cell stack thereby reducing thermal tensions and improving the overall life, integrity, and performance of the fuel cell stack.

**Claim 10:** The Fujii et al. combination does not disclose that the through-hole has a smaller cross-sectional area than the cross-sectional area of the first gas passage. However, one skilled in the art would know that decreasing the cross section area of the through hole would increase the pressure and flow of gas through the passage. Therefore, it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have

modified the cross-sectional area of the through-hole depending upon the desired pressure and gas flow through the through-hole.

***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claim 18 is rejected under 35 U.S.C. 102(b) as being anticipated by Fujii et al. (US 2002/0055031).

**Claim 18:** Fujii et al. in Figures 1-4 disclose a fuel cell, comprising:

a membrane electrode assembly (abstract),

a bipolar plate (10) disposed outside the membrane electrode assembly and

a cooling mechanism (10) which cools the bipolar plate, wherein: the bipolar plate is solid, and comprises:

a gas inlet (12C) for introducing gas,

(13C) a gas outlet for discharging gas,

a first gas passage (211A) formed on a surface on the side of the membrane electrode assembly, whereof one end is connected to the gas inlet and the other end is connected to a return part (201), and

a second gas passage (211B) formed parallel to the first gas passage on the surface on the side of the membrane electrode assembly, whereof one end is connected to the first gas passage

via the return part (201) and the other end is connected to the gas outlet. See paragraphs [0019]-[0024], [0026]-[0027], [0065]-[0125], [0135]-[0144].

The recitation, “the cooling mechanism cools the bipolar plate so that the temperature of the gas flowing through the first gas passage is lower, the nearer the gas inlet is” has been considered as a function limitation that adds no additional structure to the cooling mechanism. However, because the cooling mechanism is the same as that instantly claimed, it anticipates the claimed function.

### ***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. as applied to claim 18 above, and further in view of Takahashi et al. (US 7,049,016).

Fujii et al. are as applied, argued, and disclosed above, and incorporated herein.

**Claim 19:** Fujii et al. do not disclose a controller which functions to: regulate the cooling performance of the cooling mechanism so that the temperature of the gas discharged from the gas outlet is higher, the larger the gas pressure or gas usage rate of the fuel cell is.

Takahashi et al. in Figure 4 and 6 discloses a controller (16) to regulate the cooling performance of the cooling mechanism. See col. 5: 36-col. 7: 29.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the cooling mechanism of Fujii et al. by incorporating the controller of Takahashi et al. because Takahashi et al. teach a controller that would have provided efficient water flow to the cooling water passage during startup from a low temperature, maintained water balance and resolved problems associated with clogging thereby improving the overall efficiency and performance of the fuel cell stack.

The recitation, “so that the temperature of the gas discharged from the gas outlet is higher, the larger the gas pressure or gas usage rate of the fuel cell is” has been considered, and construed as a functional limitation that adds no additional limitation to the controller. However, because the controller of Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance the claimed function.

**Claim 20:** The rejection is as set forth above in claim 15. However, the recitation, “so that the temperature gradient of the gas flowing through the first gas passage increases, the higher the temperature or humidity of the gas at the gas inlet is” has been considered, and construed as a functional limitation that adds no additional limitation to the controller. However, because the controller of Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance the claimed function.

**Claim 21:** The rejection is as set forth above in claim 15. However, the recitation, “so that the temperature gradient of the gas flowing through the first gas passage increases, the larger the gas usage rate of the fuel cell is” has been considered, and construed as a functional that limitation that adds no additional limitation to the controller. However, because the controller of

Takahashi et al. is structurally similar to that instantly claimed, it appears capable of performance the claimed function.

*Examiner Correspondence*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THOMAS H. PARSONS whose telephone number is (571)272-1290. The examiner can normally be reached on M-F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Examiner  
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